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Patent

HM-394PCT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: August Sprock
Serial No: 09/744,485
Filed: March 12, 2001
For: METHOD AND INSTALLATION FOR PRODUCING DUAL-PHASE
STEEL
Examiner: Deborah Yee
Art Unit: 1742

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUBMISSION OF BRIEF ON APPEAL

SIR:

Submitted herewith is a Brief On Appeal in triplicate in support of the appeal filed May 13, 2003.

A check in the amount of \$320.00 to cover the fee pursuant to 37 CFR §1.17 (f) is enclosed.

Any additional fees or charges required at this time in connection with the application may be charged to Patent and Trademark Office Deposit Account No. 11-1835.

Respectfully submitted,

FRIEDRICH KUEFFNER

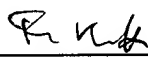
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ENCLS: CHECK \$320.00

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By:  Date: July 1, 2003
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20/12/03
07/15/03

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BRIEF ON APPEAL

S I R:

This Brief is submitted in support of the Appeal filed May 13, 2003 from the Examiner's Final Rejection of claim 5, as set forth in the Office Action dated January 24, 2003.

07/08/2003 MAHMED1 00000016 09744485

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REAL PARTY IN INTEREST

The present application is owned by SMS Schloemann-Siemag AG by virtue of an assignment recorded April 23, 2001, under reel 011746/frame 0352.

RELATED APPEALS AND INTERFERENCES

There are no presently pending related appeals and interferences.

STATUS OF CLAIMS

Claim 5 is the only claim in the application and is the claim on appeal.

STATUS OF AMENDMENTS

Original claims 1-4 were deleted with an amendment filed March 5, 2002, and replaced by new claims 5-7. Claims 6 and 7 were cancelled in an amendment after rejection filed July 30, 2003. The amendment after final rejection was filed April 11, 2003. The Examiner issued an Advisory Action on May 1, 2003.

SUMMARY OF THE INVENTION

The present invention is directed to a method for producing dual-phase steels.

As described in the first paragraph on page 1 of the specification, the present invention is specifically directed to a method for producing dual-phase steels from the hot-rolled state with a two-phase microstructure of 70 to 90 % ferrite and 30 to 10 % martensite by a controlled temperature guiding and defined cooling strategy during the cooling of the steels, inter alia by means of water cooling after their finish rolling, wherein in a first cooling stage at a first cooling rate the cooling curve enters the ferrite region and in a second cooling stage at a second cooling rate faster than the first slow cooling rate further cooling is carried out to temperatures below the martensite starting temperature.

In accordance with the present invention, as described in the second full paragraph on page 3 of the specification, the first cooling stage is carried out at a cooling rate of 20-30 K/s. As described in the paragraph bridging pages 6 and 7 of the specification, and as illustrated in the drawing, the cooling stretch for carrying out the first cooling stage is comprised of

several water cooling stages 7 positioned successively at a spacing from one another. The cooling curve 10 is allowed in the first cooling stage to enter the ferrite region at a temperature still so high that the ferrite formation takes place quickly. Before beginning the second cooling stage, which follows without intermediate air cooling and holding time directly after the first cooling stage, already at least 70 % of the austenite are transformed to ferrite by continuing cooling of the first cooling stage during the transformation of the austenite into ferrite up to the desired ferrite contents of at least 70%.

ISSUE PRESENTED FOR REVIEW

Whether claim 5 is unpatentable under 35 U.S.C. §103(a) over the English translation of Japanese patent 57-104650.

ARGUMENT

It is respectfully submitted that the Examiner's rejection of claim 5 under 35 U.S.C. §103(a) as being unpatentable over the English translation of Japanese patent because the reference does not disclose or suggest the present invention as claimed.

The Examiner takes the position that the English translation

of JP 57-104650 discloses steels with a dual-phase microstructure of 70 to 90 % ferrite and 10 to 30 % martensite processed in substantially the same way as claimed by the applicant. The examiner points to examples 4-8 of Table 2 on page 17 and the disclosure of page 15. According to the examiner, the examples are processed by hot-rolling with a finishing temperature of the 825°C (T2) followed by cooling at 20°C/sec (C1) to a temperature of 600°C (T3) to produce a microstructure of ferrite and untransformed austenite wherein the material is then subjected to faster cooling at 60°C/sec (C2) to a coiling temperature (T4) to convert untransformed austenite into martensite.

According to the Examiner, the ferrite content is shown to be present after the first cooling step (p. 13) where it is disclosed that the first cooling (C1) at 5-30°C/sec to T3 provides a ferrite/austenite structure and on second cooling (C2) between T3 and T4 the austenite converts to martensite.

The Examiner further argues that the JP reference meets the recited steps as claimed in the instant application and is therefore within the generic method claimed by applicant. The examiner also states that alloying constituents greatly influence the steel microstructure and even though the present intention does not claim compositional limitations such compositional

limitations would still be an important factor and consideration in regard to obtaining the dual-phase microstructure.

Applicant would like to submit that the present invention concerns the manufacture of dual-phase steels with a two-step cooling process after finish-rolling by first performing a slow cooling step and then a fast cooling step, wherein a dual-phase structure of 70-90 % ferrite and 30-10 % martensite is obtained.

This method is characterized in that the first slow cooling is carried out in the cooling stretch of water cooling stages arranged at a spacing to one another at a cooling rate of 20-30 K/s such that the cooling curve enters the ferrite range still at such a high temperature that the ferrite formation can take place quickly (see Fig. 2, at 15) and this cooling is continued without temperature limitations until at least 70 % of the austenite has been converted into ferrite before the faster second cooling step is carried out. This characterizing feature of claim 1 provides a clear teaching in regard to how long and at which rate the first slow cooling is to be performed in order to obtain, independent of the chemical composition of the steels, the desired dual-phase steel with at least 70 % ferrite.

Claim 5 clearly teaches to perform cooling in a first step

such that at least 70 % ferrite is present before beginning the second cooling step. The method of the invention does not concern the manufacture of dual-phase steels with the aforementioned contents but resides in a special method for reliably obtaining a dual-phase steel having the desired ferrite contents.

The English translation of JP 57-104650 describes a method for producing a hot-rolled steel sheet with excellent forming properties indicating the permissible ranges of possible alloying constituents C, Si, Mn, Cr, Al, S, Nb, V, Ti, Zr, Mo, Cu, Ni, P, Ca, rare earth metals. For producing such a steel plate according to the only method claim with a composition corresponding to the above listing of elements, the rolled steel, beginning at a final rolling temperature of 800-900°C is initially cooled slowly. This slow cooling action is carried out at a cooling rate between 5-30°C/sec to a temperature between the A_{r1} point and 550°C. This is followed by a second rapid cooling at 30°C/sec or more to a coiling temperature of 350-500°C.

The disclosed wide temperature and cooling rate ranges are required in order to obtain, despite the different chemical compositions of the steels, a steel plate with a ferrite contents of at least 80 %. This is clearly demonstrated by the comparison of tables 1 and 2 showing 19 different steel compositions. The

different steel compositions listed in table 1 are first cooled, starting at a rolling end temperature of 825°C (T2), slowly to 600°C (T3) and then at a cooling rate of 60°C/sec to the coiling temperature. The obtained properties and microstructure components are shown in table 2. Depending on the initial composition, F + 5 % M (Steel No. 9) to F + 50 % M (Steel No. 13) and F + P (Steel No. 15 and 16) are listed, i.e., a wide variety of microstructural compositions. For the examples 4-8 identified by the examiner, the following compositions are disclosed:

No. 4	F + 80 % M
✓ No. 5	F + 15 % M
✓ No. 6	F + 10 % M
✓ No. 7	F + 20 % M
No. 8	F + 25 % M

As can be taken from table 2 as well as from the explanation provided in the reference, the desired steel strip properties are obtained with the disclosed method only for those steels having a special chemical composition because the effect of the alloy elements is great and must be considered in this connection. The otherwise resulting fluctuations in the ferrite contents are clearly shown in table 2. As is apparent from the values of table 2 in combination with the disclosure of table 1 relating to

the composition of the steel alloys tested, the steel composition and variations in percentages of the various elements contained in the steel alloy are apparently decisive in regard to the final ferrite structure of the produced steel alloy - not the cooling process carried out with the prescribed cooling rates and at the prescribed temperatures. Only by employing the disclosed steel composition, it is possible to obtain the specified ferrite contents of >70 % with the prior art method.

Accordingly, the JP reference teaches cooling to a **specific temperature** at a specific rate in the first slow cooling step. There is no teaching in regard to first ensuring a > 70 % ferrite contents before beginning the second cooling step. The prior art method only prescribes a target temperature and a specific cooling rate and thus a specific cooling duration.

In contrast to this, the present invention clearly prescribes that a particular **parameter of the microstructure (ferrite contents)** must have reached a certain value in the first cooling stage before the second cooling stage is begun. The cited prior art never mentions that a specific ferrite contents must be present before the second cooling step is initiated. The prior art teaching of cooling to a certain temperature cannot make obvious the **claimed step of cooling to a certain ferrite contents**

since there is no inherent or disclosed correlation between the proposed temperature and the resulting ferrite contents of the end product. The invention proposes to carry out the first cooling step to a certain ferrite contents - this cannot be obvious in view of the ferrite contents of the prior art end product varying greatly depending on the composition.

This means that for obtaining the desired steel properties, depending on the chemical composition of the steels, only certain cooling parameters of the aforementioned wide range of cooling parameters disclosed in the reference are suitable for a specific steel composition and must be properly selected prior to carrying out the cooling steps. With regard to the first cooling step, the microstructural conversion according to the invention is carried out **without defining a temperature or time limit** while the JP reference employs instead a **predetermined cooling rate and temperature limits** and thus a resulting cooling time.

In summarizing the above, it should again be underscored that the examiner's position that both methods have the same result in regard to the microstructure and that accordingly the selected methods steps are not decisive, is incorrect. While in the method of the present invention, independent of the composition, the second cooling step is started only when the

condition of a ferrite contents of at least 70 % is met, the second cooling step according to the prior art reference is started, independent of the ferrite contents, according to a time parameter. Moreover, it should be mentioned that the so-called dispersed cooling used in this connection is also not disclosed in the cited prior art reference.

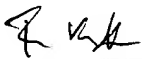
The JP reference can only teach that for a specific steel alloy containing exactly the specified percentages of elements in the steel alloy and the specified Si/Mn percentage ratio, a martensite contents from 1 to 30 % can be achieved by performing cooling with the described parameters. See also the "Purpose" declared in the Abstract of JP 57-104650: " ... by properly controlling the hot rolling and cooling conditions of a steel having an especially regulated S content and specified relation between Si and MN.". There is no teaching to **deliberately take the first cooling step to a ferrite contents of 70 % before starting the second cooling step** since the cooling process of the prior art is strictly based on the temperatures to be reached and the cooling rate - the resulting ferrite contents is not the parameter to be observed but more or less the accidental result of the cooling operation and the steel composition.

Claim 5 is therefore not obvious on view of the Japanese

reference.

In view of the foregoing, it is submitted that the claim is allowable over the references relied on by the Examiner and the Board is respectfully requested to reverse the decision of the Examiner.


Respectfully submitted,

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Dated: July 1, 2003

MAILING CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D. C. 20231, on July 1, 2003.

By:  Date: July 1, 2003
Friedrich Kueffner

APPENDIX

CLAIM ON APPEAL

5. A method for producing dual-phase steels from the hot-rolled state with a two-phase microstructure of 70 to 90 % ferrite and 30 to 10 % martensite by a controlled temperature guiding and defined cooling strategy during the cooling of the steels, inter alia by means of water cooling after their finish rolling, wherein in a first cooling stage at a first cooling rate the cooling curve enters the ferrite region and in a second cooling stage at a second cooling rate faster than the first slow cooling rate further cooling is carried out to temperatures below the martensite starting temperature, the method comprising the steps of :

carrying out the first cooling stage at a cooling rate of 20-30 K/s in a cooling stretch comprised of several water cooling stages positioned successively at a spacing from one another;

allowing the cooling curve in the first cooling stage to enter the ferrite region at a temperature still so high that the ferrite formation takes place quickly; and,

before beginning of the second cooling stage, which follows without intermediate air cooling and holding time directly after the first cooling stage, transforming already at least 70 % of the austenite to ferrite by continuing cooling of the first cooling stage during the transformation of the austenite into ferrite up to the desired ferrite contents of at least 70 %.